IN THE CLAIMS:

Claim 1 (currently amended): A method for surface modification in manufacturing high temperature superconducting device, comprising the step of:

bombarding a surface of a preformed material with a particle beam having energy to increase the smoothness of the material surface and change the microstructure or internal defect of the processed material;

wherein the particle beam is generated by a plasma sputtering device; and the energy of the particle beam is in the range of 5-50000eV~~, and the incidence angle of the particle beam is in the range of 5-85 degree~~.

Claim 2 (currently amended): The method according to claim 1, wherein the material is MgO~~, and the incidence angle of the particle beam is in the range of 35-85 degree~~.

Claim 3 (currently amended): The method according to claim 1, wherein the material is CeO_2~~, and the incidence angle of the particle beam is in the range of 45-85 degree~~.

Claim 4 (currently amended): The method according to claim 1, wherein the material is a cold rolled Ni substrate~~, and the incidence angle of the particle beam is in the range of 10-80 degree~~.

Claim 5 (currently amended): The method according to claim 1, wherein the material is YBCO~~, and the incidence angle of the particle beam is in the range of 5-85 degree~~.

Claim 6 (original): The method according to claim 1, wherein the material is any one of following metal materials: Ni, NiO, Ni alloy, Cu, Cu alloy, Ag, Ag alloy, Fe, Fe alloy, Mg and Mg alloy, purities of the alloy materials are more than 99% and alloying constituents of the metal alloys are at least 0.01wt.%.

Claim 7 (original): The method according to claim 1, wherein the material is any one of following semiconductor materials: Si, Ge, GaAs, InP, InAs, InGaAs, CdS, GaN, InGaN, GaSb and InSb.

Claim 8 (original): The method according to claim 1, wherein the material is any one of following oxide materials: $SrTiO_3$, $LaAlO_3$, Y_2O_3, RuO_2, CeO_2, MgO, ZrO_2, SiO_2, Al_2O_3 and yttria-stabilized zirconia (YSZ).

Claim 9 (original): The method according to claim 1, wherein the material is any one of the following superconducting materials: $YBa_2Cu_3O_{7-\delta}$ ($0<\delta<0.5$), $REZ_2Cu_3O_{7-\delta}$ (RE is a rare earth element Z is an alkaline rare earth element $0<\delta<0.5$), Bi-Sr-Ca-Cu-O, TI-Ba-Ca-Cu-O.

Claim 10 (original): The method according to claim 1, wherein the modification of the material is bulk, external or internal.

Claim 11 (original): The method according to claim 1, wherein the surface of the material is monocrystalline, amorphous or polycrystalline structure.

Claim 12 (original): The method according to claim 1, wherein the surface of the material is polished or unpolished.

Claim 13 (original): The method according to claim 1, wherein the material is a substrate, a transition layer, a superconducting layer preformed in the process of manufacturing the superconducting device, or any combination of them.

Claim 14 (canceled).

Claim 15 (original): The method according to claim 1, further comprising annealing the material bombarded with the particle beam, wherein the annealing temperature is in the range of 100-1500°C.

Claim 16 (original): The method according to claim 6, wherein alloying constituents of the metal alloys are at least 0.1wt.%.

Claim 17 (currently amended): A high temperature superconducting device, comprising:

a substrate; and

a high temperature superconducting film formed on the substrate,

wherein the high temperature superconducting film exhibits oblique cone topography characteristic after being bombarded with a particle beam having energy, wherein the particle beam is generated by a plasma sputtering device, and the energy of the particle beam is in the range of 5-50000eV~~, and the incidence angle of the particle beam is in the range of 5-85 degree~~.

Claim 18 (original): The high temperature superconducting device according to claim 17, wherein the high temperature superconducting film is annealed after being bombarded with the particle beam, and the annealing temperature is in the range of 100-1500°C.